

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What is science?
- How are matter and energy related to physical science?
- What are the branches of physical science?

National Science Education Standards

PS 1a, 3a

What Is Science?

You are eating soup and you see your reflection in the spoon. It is upside down. You wonder, “Why is my reflection upside down in a spoon, but not in a mirror?” Asking questions like this one is the first step in doing science.

Science is a process of collecting information about the world. Much of the time, the first step in collecting information is asking a question.

You may not realize it, but you use science every day. When you use the brakes on your bicycle to slow down, you use your knowledge of science. You learned how hard you should apply the brakes by making observations. Making observations, asking questions, and trying to find the answers is what science is all about.



Part of science is asking questions about the world around you.

STUDY TIP

Compare After you read this section, make a chart comparing the two main branches of physical science. In the chart, describe what scientists in each branch study.

 **Say It**

Discuss In a small group, talk about different ways that you use science in your everyday life.

TAKE A LOOK

1. Identify What is often the first step in gathering information?

SECTION 1 Exploring Physical Science *continued*

What Is Physical Science?

Science is divided into many *branches*, or parts. Three major branches of science are Earth science, life science, and physical science. **Physical science** is the study of matter and energy.

Matter is the “stuff” that everything is made of. Your shoes, your pencil, and the air you breathe are made of matter. *Energy* is the ability to do work. Matter and energy are related because all matter has energy.

Sometimes, you can see or feel energy, such as light or heat. Sometimes, you can tell that an object has energy because it is moving.

All matter contains energy, even if you cannot see or feel the energy. For example, food contains energy. When you eat the food, you get energy from the food. You can use the energy to do all of your daily activities.

STANDARDS CHECK
<p>PS 3a Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.</p>
<p>2. Identify Give two examples of energy.</p> <p>_____</p> <p>_____</p>



The baseball has energy even before the boy throws it, because it is matter, and all matter has energy.

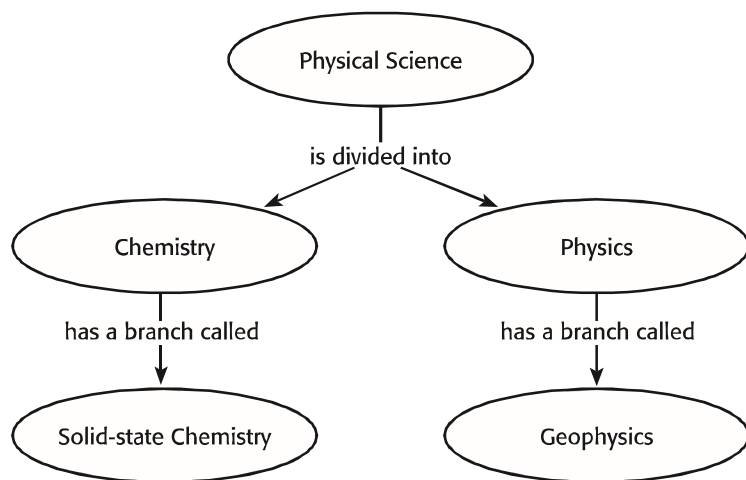
TAKE A LOOK

3. Explain Why does the baseball have energy before the boy throws it?

Why will paper burn, and gold will not? Why is throwing a bowling ball harder than throwing a baseball? How does water turn into steam? The answers to these questions have to do with matter and energy. As you study more about physical science, you will learn more about matter and energy. You will see how matter and energy are related to each other.

SECTION 1 Exploring Physical Science *continued***What Are the Branches of Physical Science?**

Physical science is divided into two main branches: chemistry and physics. Both chemistry and physics can be divided into even smaller areas of study. For example, a smaller branch of chemistry is solid-state chemistry. *Solid-state chemistry* is the study of the reactions and behavior of solid materials. Another example is geophysics, a smaller branch of physics. *Geophysics* is the study of movements deep in the Earth. ✓

**CHEMISTRY**

Chemistry is the study of the structure and properties of matter. The structure and properties of a substance determine how it interacts with other matter. For example, sugar dissolves in water. A diamond has a different structure and properties, so it doesn't dissolve in water.

The structure and properties of matter also affect how it behaves under different conditions. For example, water is a liquid at room temperature. If the temperature decreases, the water may become solid. However, honey has a different structure and properties. It will become solid at a different temperature than water.

Chemistry also includes the study of how matter changes. Substances can change during chemical reactions. A *chemical reaction* happens when one substance interacts with another substance to form a new substance. Chemical reactions are happening all the time. When your body digests food, a chemical reaction is taking place. Chemical reactions are what make flashlights work. They also allow car engines to run.

READING CHECK

4. Identify What are the two main branches of physical science?

Critical Thinking

5. Explain Why don't all substances behave the same way under the same conditions?

SECTION 1 Exploring Physical Science *continued*

Critical Thinking

6. Compare How is physics different from chemistry?

PHYSICS

The second area of physical science is physics. Like chemistry, physics has to do with matter. *Physics* is the study of how energy affects matter. The study of physics can help you understand how a roller coaster works and what keeps it on its tracks.



You can tell that a roller coaster has energy. When you study physics, you will learn what makes the roller coaster ride so exciting.

Say It

Ask Questions Write down four questions that physics may be able to help you answer. Share your questions with a small group.

Why does a ball roll down a hill? Why doesn't a brick roll down the same hill? How does a parachute let someone jump out of an airplane without getting hurt? How can a compass tell you which way is north? Physics can help you answer questions like these.

Motion, force, gravity, electricity, light, and heat are parts of physics. They are also things that you experience in your everyday life. For example, when you ride a bike, you are dealing with force and motion. If you fall off the bike, you are affected by gravity.

How Do Other Branches of Science Use Physical Science?

You learn about matter and energy when you study physical science. However, matter and energy are important in other branches of science, too. Many kinds of scientists use ideas from physical science in their work.

SECTION 1 Exploring Physical Science *continued***METEOROLOGY**

The study of Earth's atmosphere, weather, and climate is called *meteorology*. Scientists who study meteorology are called *meteorologists*. You may have seen meteorologists on the news, forecasting the weather. Other meteorologists study severe weather, such as hurricanes and tornadoes. They may be able to predict where severe weather will form so they can warn people. ✓

Before they can predict the weather, meteorologists need to understand pressure, motion, and force. These are ideas that you will study in physical science.

GEOLOGY

The study of the history, structure, and formation of Earth is called *geology*. One kind of geologist is a geochemist. A *geochemist* is a person who studies the chemistry of rocks, minerals, and soil. Geochemists also need to know about heat and force to understand how parts of Earth formed and how they have changed. ✓



This geochemist takes rock samples from the field. Then, she studies them in her laboratory.

BIOLOGY

Believe it or not, life science and physical science are related. Chemistry and physics can explain many things that happen in biology. For example, a chemical reaction explains how animals get energy from food.

Plants make sugar. Animals eat plants and breathe in oxygen. In animals, the sugar reacts with the oxygen to make carbon dioxide, water, and energy. You will learn about this and other chemical reactions when you study physical science.

 **READING CHECK**

7. Define What is meteorology?

 **READING CHECK**

8. Identify Give two reasons that geochemists need to understand physical science.

Section 1 Review

NSES PS 1a, 3a

SECTION VOCABULARY

physical science the scientific study of nonliving matter	science the knowledge obtained by observing natural events and conditions in order to discover facts and formulate laws or principles that can be verified or tested
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1. **Identify** What are three main branches of science?

2. **Define** What are matter and energy? How are they related?

3. **Infer** A scientist is studying the forces that act on a hockey puck. What branch of physical science is the scientist probably using? Explain your answer.

4. **Explain** Why does a meteorologist need to understand physics?

5. **Apply Ideas** You are building a go-cart. You want to know how you can make it go as fast as it can. Explain how you can use both chemistry and physics to help you build your go-cart.

6. **Explain** Why does a biologist need to understand chemistry?
